

We claim:

- 1 1. A method of setting the drive and sense frequencies of a gyroscope
- 2 having a drive mass and a sense mass coupled together by a flexure assembly
- 3 comprising:
 - 4 selecting a drive stiffness, K_d ;
 - 5 selecting geometric parameters of said flexure assembly to obtain a desired drive
 - 6 frequency, ω_d ;
 - 7 selecting a configurational parameter of said flexure assembly to obtain a desired
 - 8 sense frequency, ω_s ; and
 - 9 determining whether said gyroscope has obtained desired performance and size
 - 10 envelope characteristics.

- 1 2. The method of claim 1 further comprising repeating selecting a drive
- 2 stiffness, K_d ; selecting geometric parameters of said flexure assembly to obtain a
- 3 desired drive frequency, ω_d ; and selecting a configurational parameter of said flexure
- 4 assembly to obtain a desired sense frequency, ω_s ; until it is determined that said
- 5 gyroscope has obtained desired performance and size envelope characteristics.

1 3. The method of claim 1 where selecting geometric parameters of said
2 flexure assembly to obtain a desired drive frequency, ω_d , comprises selecting length
3 and/or width of at least one individual flexure within said flexure assembly.

1 4. The method of claim 3 where selecting length and width of at least one
2 individual flexure within said flexure assembly comprises selecting length and/or width
3 of each individual flexure within said flexure assembly.

1 5. The method of claim 1 where selecting a configurational parameter of said
2 flexure assembly to obtain a desired sense frequency, ω_s , comprises selecting an
3 orientation of at least one flexure within said flexure assembly relative to other ones of
4 said flexures with said flexure assembly.

1 6. The method of claim 5 where flexures within said flexure assembly are
2 oriented symmetrically about an axis of symmetry of said gyroscope, and where
3 selecting an orientation of at least one flexure within said flexure assembly relative to
4 other ones of said flexures with said flexure assembly comprises selecting one of a
5 possible number of orientations of said at least one flexure to said axis of symmetry of
6 said gyroscope.

1 7. The method of claim 1 where said flexure assembly includes at least one
2 pair of flexures, and where selecting a configurational parameter of said flexure

3 assembly to obtain a desired sense frequency, ω_s , comprises selecting an angle which
 4 said pair of flexures makes to each other.

1 8. The method of claim 7 where said flexure assembly comprises two
 2 diametrically opposing pairs of flexures and where selecting an angle which said pair of
 3 flexures makes to each other comprises setting a dihedral angle between each of said
 4 flexures of said two diametrically opposing pairs.

1 9. The method of claim 1 where selecting geometric parameters of said
 2 flexure assembly to obtain a desired drive frequency, ω_d , comprises selecting length, L,
 3 and width, w, of four flexures formed into two pairs comprising said flexure assembly,
 4 where

$$\omega_d^2 = \frac{4 E w^3 t R^2}{12 L^3 I_d}$$

5 6 where E is the Young's modulus of said flexure, t is the process thickness of said
 7 flexure, I_d is the rotational moment of inertia of said drive mass about a rate axis, and R
 8 is the radius of said drive mass, where said drive mass is a ring-shaped mass.

1 10. The method of claim 1 where selecting a configurational parameter of said
 2 flexure assembly to obtain a desired sense frequency, ω_s , comprises selecting θ in

$$\omega_s^2 = \frac{4 E w t^3 \sin \theta R^2}{12 L^3 I_s}$$

4 where E is the Young's modulus of said flexure, t is the process thickness of said
5 flexure, I_s is the rotational moment of inertia of said sense mass about a sense axis, R is
6 the radius of said drive mass, where said drive mass is a ring-shaped mass, L is the
7 length of each flexure within said flexure assembly, and w is the width of each flexure
8 within said flexure assembly which is comprised of four flexures formed into two pairs.

1 11. The method of claim 9 where selecting a configurational parameter of said
2 flexure assembly to obtain a desired sense frequency, ω_s , comprises selecting θ in

3
$$\omega_s^2 = \frac{4 E w t^3 \sin \theta R^2}{12 L^3 I_s}.$$

1 12. An improvement in a gyroscope comprising:
2 a drive mass;
3 a sense mass; and
4 a flexure assembly coupling said drive and sense mass together;
5 where said drive mass has a selecting drive stiffness, K_d obtained by selecting
6 geometric parameters of said flexure assembly to obtain a desired drive frequency, ω_d ;
7 and where said sense mass has a sense stiffness K_s obtained by selecting a
8 configurational parameter of said flexure assembly to obtain a desired sense frequency,
9 ω_s , and where said gyroscope has obtained desired performance and size envelope
10 characteristics by independent selection of said geometric and configurational
11 parameters of said flexure assembly.

1 13. The improvement of claim 12 where said geometric parameters of said
2 flexure assembly selected to obtain a desired drive frequency, ω_d , comprise length
3 and/or width of at least one individual flexure within said flexure assembly.

1 14. The improvement of claim 13 where said selected length and width of at
2 least one individual flexure within said flexure assembly comprises a selected length
3 and/or width of each individual flexure within said flexure assembly.

1 15. The improvement of claim 12 where said configurational parameter of said
2 flexure assembly selected to obtain a desired sense frequency, ω_s , comprises a
3 selected orientation of at least one flexure within said flexure assembly relative to other
4 ones of said flexures with said flexure assembly.

1 16. The improvement of claim 15 where flexures within said flexure assembly
2 are oriented symmetrically about an axis of symmetry of said gyroscope, and where
3 said a selected orientation of at least one flexure within said flexure assembly relative to
4 other ones of said flexures with said flexure assembly comprises a selected one of a
5 possible number of orientations of said at least one flexure to said axis of symmetry of
6 said gyroscope.

1 17. The improvement of claim 12 where said flexure assembly includes at
2 least one pair of flexures, and where said configurational parameter of said flexure

3 assembly selected to obtain a desired sense frequency, ω_s , comprises a selected angle
 4 which said pair of flexures makes to each other.

1 18. The improvement of claim 17 where said flexure assembly comprises two
 2 diametrically opposing pairs of flexures and where said angle which said pair of flexures
 3 makes to each other comprises a selected dihedral angle between each of said flexures
 4 of said two diametrically opposing pairs.

1 19. The improvement of claim 12 where said geometric parameters of said
 2 flexure assembly selected to obtain a desired drive frequency, ω_d , comprises a length,
 3 L, and width, w, of four flexures formed into two pairs comprising said flexure assembly,
 4 where

$$\omega_d^2 = \frac{4 E w^3 t R^2}{12 L^3 I_d}$$

6 where E is the Young's modulus of said flexure, t is the process thickness of said
 7 flexure, I_d is the rotational moment of inertia of said drive mass about a rate axis, and R
 8 is the radius of said drive mass, where said drive mass is a ring-shaped mass.

1 20. The improvement of claim 12 where said configurational parameter of said
 2 flexure assembly selected to obtain a desired sense frequency, ω_s , comprises a
 3 selected θ in

$$\omega_s^2 = \frac{4 E w t^3 \sin \theta R^2}{12 L^3 I_s}$$

5 where E is the Young's modulus of said flexure, t is the process thickness of said
6 flexure, I_s is the rotational moment of inertia of said sense mass about a sense axis, R is
7 the radius of said drive mass, where said drive mass is a ring-shaped mass, L is the
8 length of each flexure within said flexure assembly, and w is the width of each flexure
9 within said flexure assembly which is comprised of four flexures formed into two pairs.

1 21. The improvement of claim 19 where said configurational parameter of said
2 flexure assembly selected to obtain a desired sense frequency, ω_s , comprises a
3 selected θ in

$$\omega_s^2 = \frac{4 E w t^3 \sin \theta R^2}{12 L^3 I_s}.$$